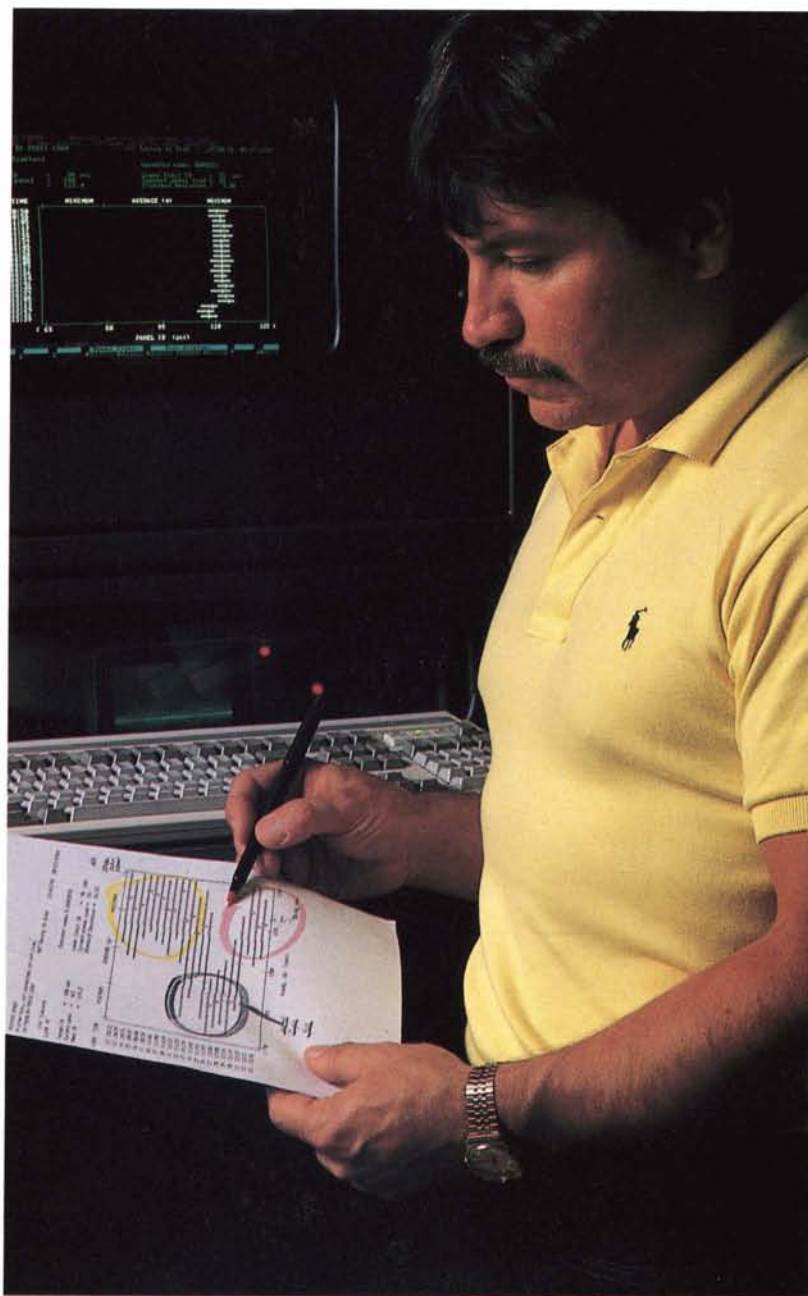
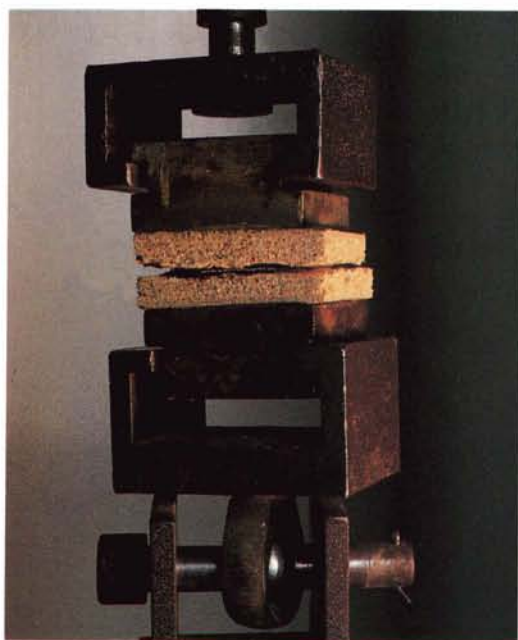


## Wood Bond Testing

At right is a Bondcheck™ inspection system, a significant advance in production quality control that offers a nondestructive method of measuring the internal bond strength of wood particle board.

The internal bond analyzer (IBA) performs an acoustic-ultrasonic bonding efficiency measurement, combining ultrasonics with the acoustic emission testing technique to overcome shortcomings of either method and produce a highly efficient hybrid system. The IBA resulted from a multiyear joint development program between Hartford Steam Boiler Inspection Technologies, Sacramento, California, and The Weyerhaeuser Company, Tacoma, Washington, a major forest products firm. The system is thus a spinoff from an aerospace spinoff, stemming from a NASA-invented acousto-ultrasonic technique and test instrument that became a commercial system for testing the bond strength of composite materials.

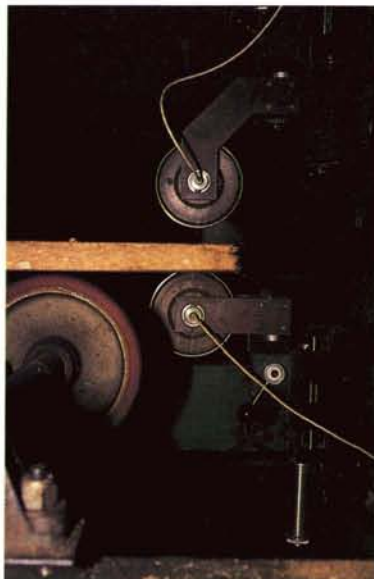


In the latter 1970s, Lewis Research Center was looking for better ways to test composites, which at that time were finding rapidly expanding acceptance in a variety of aerospace applications. Lewis wanted a nondestructive method that would not only detect flaws but also evaluate a composite material's strength and endurance. The center came up with the hybrid system that combined a proven metal-testing technique—ultrasonics—with the then relatively new technique known as acoustic emission testing.

In the original system, ultrasonic "stress waves" were injected into a composite structure. As the stress waves propagated through the material, the waveform was changed if flaws or irregularities existed. The changed signal from the ultrasonic pulser was detected by an acoustic emission sensor and analyzed. In a display section of the instrument, flaw and strength assessment information was presented in both graphic and digital form.

The Lewis technology was acquired by Acoustic Emission Technology Corporation (AET), a predecessor company of Hartford Steam Boiler Inspection. AET refined and commercialized the technology and produced, in the early 1980s, two types of acousto-ultrasonic test systems known as Model 206 and Model 301. The IBA builds on the AET technology and moves into a new area of application: on-line process control systems.

Previous methods of determining the internal bond strength of wood particle board involved destructive tests on parts cut from boards; the far left photo exemplifies the "old way" in which adhesives were applied to board samples and then the samples were pulled by machine until they came apart. There was a substantial time lapse before test results were available to the particle board mill operator.



The IBA system determines bond strength by measuring the changes in pulsed ultrasonic waves injected into a board by a specially designed rolling contact transducer (top). Analysis of the waveforms by a proprietary method of calculation determines the average internal bond strength for the panel. Results are displayed immediately, while the panel is still on the conveyor production line. Customers can get a computer printout (above) showing the quality consistency of their shipments.

The system offers additional advantages: the mill operator can adjust the proportion of resin to wood particles and reduce setup time required when changing to a different product. The IBA also offers startup waste reduction, consistent quality internal bonds and automatic marking of deficient products. These advantages add up to substantial cost savings.

<sup>TM</sup> Bondcheck is a trademark of Hartford Steam Boiler Inspection Technologies.